The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte STEPHEN McLAUGHLIN and MICHAEL BANBROOK

Appeal No. 2005-2613
Application 09/043,171[1]

HEARD: November 15, 2005

Before JERRY SMITH, BARRETT, and LEVY, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1-11 and 16-20.

We reverse.

[1] Application for patent filed March 12, 1998, entitled "Waveform Synthesis."

BACKGROUND

The invention relates to sound waveform synthesis as described in the summary of the claimed subject matter (brief, pages 2-4).

Claim 1 is reproduced below.

> 1. A method of generating a cyclical sound waveform corresponding to a sequence of substantially similar cycles, said method comprising:
>
> (a) generating a cyclical sound waveform sample;
>
> (b) generating a successive cyclical sound waveform sample from said cyclical sound waveform sample and transformation data, wherein said transformation data comprise data defining the evolution of said cycles in a temporal vicinity of said cyclical sound waveform and the change in shape of said cycles in said temporal vicinity from cycle to cycle;
>
> (c) designating said successive cyclical sound waveform sample as a cyclical sound waveform sample and repeating (b);
>
> (d) repeating (c) a plurality of times to generate a sequence of said successive cyclical sound waveform samples corresponding to a plurality of said cycles; and
>
> (e) outputting the samples of said sequence to generate a waveform representing a cyclical sound.

THE REFERENCES

The examiner relies on the following references:

Mitsumi	4,635,520	January 13, 1987
Otsuka et al. (Otsuka)	5,745,651	April 28, 1998 (filed May 30, 1995)

Gernot Kubin, Chapter 10: Nonlinear Processing of Speech, in Speech Coding and Synthesis (W.B. Kleijn and K.K. Paliwal, eds., Elsevier Science B.V., 1995), pages 557-559, 581-587, and 600-610 (referred to by examiner as "Kleijn").

THE REJECTIONS

Claims 1-4, 7-11, and 18 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Otsuka.

Claims 5, 6, 16, and 17 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Otsuka and Kleijn.

Claims 19 and 20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Mitsumi and Otsuka.

We refer to the final rejection and the examiner's answer (pages referred to as "EA__") for a statement of the examiner's rejection, and to the brief (pages referred to as "Br__") for a statement of appellants' arguments thereagainst.

DISCUSSION

Claims 1-4, 7-11, and 18

Claim 18 is the apparatus version of method claim 1 in "means for" format. Claim 1 is taken as representative.

Appellants argue that the term "sample" in a "cyclical sound waveform sample" refers to the value of a particular characteristic of the waveform at a chosen instant in time and Otsuka does not generate a "cyclical sound waveform sample" (Br5-7). It is argued that the examiner fails to clearly indicate where a "cyclical sound waveform sample" can be found in Otsuka (Br7). It is argued that, to the extent the examiner suggests that this claim feature is taught by the feature in Otsuka of "a parameter of a frame to be processed," a parameter

series is generated for each frame and comprises three separate parameters all of which apply over one whole frame, so they cannot be described as the amplitude of a speech signal at a chosen instant, i.e., as a sample (Br7-8). Appellants argue that even assuming Otsuka discloses "generating a cyclical sound waveform sample," it does not disclose the second claimed step of "generating a successive cyclical sound waveform sample from said cyclical sound waveform sample and transformation data, wherein said transformation data comprise data defining the evolution of said cycles in a temporal vicinity of said cyclical sound waveform and the change in shape of said cycles in said temporal vicinity from cycle to cycle" (Br8). It is argued that the examiner relies on the pitch waveform in Fig. 15, step S317, which actually refers to a "pitch waveform" and a pitch waveform cannot be said to be a waveform "sample" (Br8).

The examiner notes (EA11) that appellants describe that "[v]oice speech is essentially cyclical, comprising a time series of pitch pulses of similar, but not identical, shape" (specification, page 2, lines 4-5) and describe "waveform sample" at pages 7 and 11 of the specification, and therefore concludes that "according to Appellant's [sic, appellants] this definition 'cyclical sound waveform sample' is 'voiced speech segment or parameter'. The examiner interpreted the 'cyclical sound waveform sample' as 'sample, which produces cyclical sound

(voiced speech) waveform'." (EA11-12.) The examiner finds that "[b]oth Appellant and Otsuka used the term 'waveform' and 'sample'. Therefore, claimed limitation 'generating a cyclical sound waveform sample' [] reads on Otsuka's [discussion of parameters at col. 4, line 34, to col. 5, line 4]." (EA12.) The examiner finds that "Otsuka also teaches at Figure 2 and 3, how value of amplitude (as a function of power) is plotted for a time instant to generate a pitch waveform (voiced speech waveform). Therefore, Otsuka teaches to generate voice speech parameter at a chosen instant of a pitch waveform." (EA12.) As to appellants' arguments about parameters, the examiner states that the parameters are for producing a synthesized speech waveform and it is unclear why the parameters do not have a value at a chosen instant and why they do not comprise a cyclical sound waveform (EA13). As to the transformation data, the examiner states that a Fourier transform is performed on the resultant sample value to provide a pitch waveform (EA15). The examiner notes that "pitch waveform" has not been interpreted as a "cyclical sound waveform sample"; instead, a "cyclical sound waveform sample" is interpreted to be a "sample value" which provides a "pitch waveform" (EA15).

Appellants describe a waveform sample as being the value of the waveform at a particular instant of time in connection with sampling of a waveform, e.g., "waveform recording 11, comprising

successive digital values (e.g. samples at 20 kHz) of the waveform of an actual utterance of the phoneme in question as successive samples, x_1, x_2 ... x_N " (spec. at 7, lines 9-11). Thus, the specification teaches that a "sample" is a value of the waveform at a chosen instant in time. Otsuka uses the word "sample" four times, referring to a "sample value for a spectral envelope ... is transformed" (col. 2, lines 49-50), "Fourier transform is performed on the resultant, transformed sample value to provide a pitch waveform" (col. 2, lines 50-52), "a sample value of a spectral envelope that is acquired by a parameter is transformed" (col. 3, lines 1-2), and "a Fourier transform is performed on the transformed sample" (col. 3, lines 3-4). None of these uses of the term "sample" have the meaning of a value of the waveform at a selected point in time. The examiner's claim interpretation is not clear, nor is it explained how the parameter series is supposed to be a "cyclical sound waveform sample." To the extent it is the examiner's position that a "cyclical sound waveform sample" is a continuous waveform of predetermined duration which contains a series of pitch pulses so as to fit the definition of a "cyclical sound," i.e., a sample waveform instead of a sample of a waveform, this interpretation does not fit with the rest of the claim limitations. Claim 1 recites generating a successive cyclical sound waveform sample from a cyclical sound waveform sample, designating the successive

cyclical sound waveform sample as a cyclical sound waveform sample, and repeating the process to generate a sequence of successive cyclical sound waveform samples which are output to generate a waveform. These samples must be values of the waveform at a chosen instant in time or the limitations do not make sense. We find that Otsuka does not teach generating a "cyclical sound waveform sample."

Otsuka "generates a pitch waveform by using a synthesis parameter, which has been interpolated by the synthesis parameter interpolator 7, and a pitch scale, which has been interpolated by pitch scale interpolator" (col. 4, line 67, to col. 5, line 3). Otsuka does not perform the step of "generating a successive cyclical sound waveform sample from said cyclical sound waveform sample and transformation data, wherein said transformation data comprise data defining the evolution of said cycles in a temporal vicinity of said cyclical sound waveform and the change in shape of said cycles in said temporal vicinity from cycle to cycle." Otsuka states that a "sample value for a spectral envelope, which is obtained by a parameter, is transformed. Fourier transform is performed on the resultant, transformed sample value to provide a pitch waveform" (col. 2, lines 49-52), but this does not teach taking a "sample," defined as a value of a waveform at a chosen point in time, and generating "a successive cyclical sound waveform sample" as claimed. We have thoroughly considered

Otsuka in light of the examiner's rejection and find that Otsuka in no way teaches (or suggests) the subject matter of claim 1. The rejection of claims 1-4, 7-11, and 18 is reversed.

Claims 5, 6, 16, and 17

Claim 16 is taken as representative. The examiner finds that Otsuka teaches the method of claim 16 except for "n being an integer having a value of at least three." The examiner finds that Kleijn teaches N=3 and concludes that it would have been obvious to provide Otsuka with N=3 because Kleijn teaches that an N=3 deterministic system can reproduce a naturally sounding voiced speech waveform (EA7).

Appellants argue that in a state space representation, different axes of state space consist of waveform values separated by predetermined time intervals, so that a time in state space is defined by a set of values at times t_1, t_2, t_3, which is wholly different from simply an amplitude versus time plot of a waveform in Otsuka, and, therefore, Otsuka does not teach the claim feature of "state space representations of voiced speech signals" (Br10).

The examiner refers to a definition of "state space" as: "a space which contains the state vectors of a system. Note: the number of state variables in the system determines the dimension of the state space." (EA17.) The examiner finds that the speed coefficients and power coefficients in Otsuka, Figs. 6-12, are

"vectors" and, therefore, Fig. 11 represents a space containing two state vectors (EA17).

Figure 11 shows an amplitude versus time plot of a waveform. The axes are "amplitude" and "time," not "speed coefficients" and "power coefficients" as stated by the examiner, and the axes do not represent state variables. Otsuka does not teach a state space representation of the waveforms. In addition, Otsuka fails to teach the steps of the method performed with points in n-dimensional state space. Kleijn does not cure this deficiency. The rejection of claims 5, 6, 16, and 17 is reversed.

Claims 19 and 20

Claim 19 is taken as representative. The examiner finds that Mitsumi teaches the claimed method except for transformation data (EA8). The examiner finds that "Otsuka teaches transformation data (col. 2, lines 46-54, Fourier transform is performed on the resultant, transformed sample value to provide a pitch waveform)" (EA8), and concludes that it would have been obvious to use a transformation to provide a pitch waveform in Mitsumi because Otsuka teaches that the timbre of synthesized speech can be changed without performing a complicated process, such as a parameter operation (EA8-9).

Appellants argue that Mitsumi discloses a device that is operable to smoothly connect a repetitively output waveform and does not disclose "generating a first instantaneous value of the

amplitude of a cyclical sound waveform" and subsequently "generating a second instantaneous value of the amplitude of a cyclical sound waveform from said first instantaneous value and transformation data" (Br11).

The examiner responds, finding that these steps are taught at column 3, lines 30-64, and column 6, lines 54-67 (EA18).

The examiner-cited portions of Mitsumi teach interpolation between the first and last amplitude of a repeating second waveform (col. 3, lines 30-64) and storage of the waveshapes in memory (col. 6, lines 54-67), not "generating a first instantaneous value of the amplitude of a cyclical sound waveform" and subsequently "generating a second instantaneous value of the amplitude of a cyclical sound waveform from said first instantaneous value and transformation data." It is not clear why the examiner applies Mitsumi since claims 19 and 20 are not directed to interpolation, even though interpolation is disclosed in the specification (e.g., Fig. 15, progression between sounds described at spec at. 14-16). In addition, neither Mitsumi nor Otsuka discloses the steps of the process. Still further, we fail to see any way that the teachings of Otsuka could be logically combined with those of Mitsumi since the teachings are not related. The rejection of claims 19 and 20 is reversed.

CONCLUSION

The rejections of claims 1-11 and 16-20 are reversed.

REVERSED

JERRY SMITH
Administrative Patent Judge

LEE E. BARRETT
Administrative Patent Judge

STUART S. LEVY
Administrative Patent Judge

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